Dam ID: KA-0030
Kaloko Reservoir

Inspection No: 2016-044
Date: April 12, 2016

STATE OF HAWAII - DLNR
DAM SAFETY INSPECTION SHEET

Inspection Type: Visual Dam Safety Inspection

Persons Present	Affiliation	Phone Number
Ricky Cassiday	Lucas Trust Representative	
Edwin Matsuda	DLNR	
Denise Manuel	DLNR	

Weather Condition: ☑ Rain previous day ☐ Rainy ☐ Drizzle / Mist ☐ Cloudy/Overcast ☑ Partly Cloudy ☐ Sunny ☐ Dry

Comments: 9:15 am

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1. General: *(Information currently on file, update as required)*

Dam/Res. Name	Kaloko Reservoir		
Owner	Mary N. Lucas Trust and Pflueger Properties		
Owner Contact	Ricky Cassiday / Jimmy Pflueger	Owner Ph.	
Lessee		Lessee Ph.	
O & M Contractor	KICO – Kilauea Irrigation Company – Tom Hitch	O & M Ph.	
Nearest City	Kilauea (2.6 Miles)	Latitude	22.1781 ° (decimal)
County	Kauai	Longitude	-159.3798 ° (decimal)
Tax Map Key(s)	(4) 5-1-002:001 – Owned by Pflueger Properties - Kauai TMK Property Search (Feb 2012)		
	(4) 5-1-002:005 – Owned by Mary N Lucas Trust - Kauai TMK Property Search (Feb 2012)		

Dam Status	Active	Hazard Potential	High	Dam Size	Intermediate
Year Completed	1890	Dam Length	915 ft.	Dam Height	44 * ft.
Normal Storage	1255* ac. ft.	Max. Storage	1400* ac. ft.	Max. Surface Area	38 * ac.
Offsite Drainage Area	0.12 sq mi.	Spillway Type	NONE	Max. Spillway Q	n/a cfs

Owner owns land under dam facility: Yes
Emergency Action Plan on file with the Department: Yes
Reports on file with the Department:

- **April 2011 - Ka Loko (KA-0030) - Phase II - Existing Conditions - AECOM**
- **November 2007 - Ka Loko (KA-0030) - Phase I Report - AECOM**

*** Values are from before the dam breach**

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2. Questions for Owner's Rep.:	Yes	No	Unknown	Comments
Construction Plans Available	☐	☑	☐	
Site / Facility Map	☑	☐	☐	
Operation & Maintenance Manual	☐	☑	☐	**None on file**
Emergency Action Plan	☑	☐	☐	**Needs to be updated**
Modifications / Improvements	☐	☑	☐	
Conduct Routine Inspections	☑	☐	☐	**Daily**
Conduct Routine Maintenance	☑	☐	☐	**As needed / irrigation system being maintained/operated**
Vehicle access to site	☑	☐	☐	☐ Not accessible ☐ With Standard car ☑ Requires 4-Wheel Drive
Access during heavy rains	☑	☐	☐	☐ Not accessible ☐ With Standard car ☑ Requires 4-Wheel Drive
Access when spillway is flowing	☑	☐	☐	☐ Not accessible ☐ With Standard car ☑ Requires 4-Wheel Drive
Incident History	☑	☐	☐	☑ Breached ☐ Overtop ☐ Slide ☐ Down stream Flooding
				☐ Other: **Breach in March 2006**
Reservoir's Current Use	☑	☐	☐	☐ Sediment ☑ Irrigation ☐ Recreation ☐ Flood Control ☐ Drinking Water
				☐ Power Generation ☐ Other:

Findings and Corrective Actions:

- ☑ a. The Owner shall maintain documentations including Construction plans, specifications, improvements, modifications, Operations and Maintenance Manuals and routine inspection logs for this dam facility.
- ☑ b. An Emergency Action Plan (EAP) is on file with the department, submit any updates as applicable.
- ☐ c. An EAP is required for High and Significant Hazard Dams. Submit an updated EAP for this facility.
- ☐ d. An EAP is recommended for all dams regardless of hazard class. Submit EAP if developed for the facility.
- ☑ e. Submit current Operations and Maintenance Manual or Procedures for this dam / reservoir facility.
- ☐ f. Submit Site or Facility Map of this Dam which identifies the location of major features including outlet works controls and conduits.
- ☐ g. Submit narrative and additional information detailing the improvements, modifications, and/or alterations at the dam site, unless covered by approved dam permit.
- ☑ h. Routine inspection logs were not inspected. **Start and maintain a log book**
- ☑ i. Dam owners shall provide for routine inspection of the dam.
- ☑ j. The dam did not appear to be maintained on a regular basis.
- ☐ k. Access to site appears to be satisfactory.
- ☐ l. There is no vehicular access to the dam site. Operational and emergency plans need to reflect this deficiency or access provided.
- ☑ m. Access to dam is questionable during severe weather conditions and/or spillway overflows. Operational plans and emergency plans need to reflect this deficiency or access provided.
- ☐ n. Provide a detailed narrative of the incident, responses taken, and any damages incurred. Dam owners are required to promptly advise the department of any sudden or unprecedented flood or unusual or alarming
- ☐ o. _____

Additional Requirements:

The following investigative study(s) are:

Required	Recommended	
☐	☐	Phase I Study
☐	☐	Hazard Classification
☐	☐	Emergency Action Plan (EAP)
☐	☐	Hydrology and Hydraulics (including Probable Maximum Flood and spillway capacity)
☑	☐	Seepage Analysis
☐	☐	Stability Analysis
☐	☐	Seismic Analysis
☑	☐	Other: **Post breach remediation**

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Physical Dam Features: (Check All Applicable. Provide description of Items Observed and/or Take Photos. Indicate photo # in description.)

3. Reservoir: **Breach at 21.5 (reference EM-March 5, 2012)**

Level during inspection **19.97** ft per **USGS Real Time Gage** (gage / other)

Normal Operating Level/Range **19 to 21** ft per **USGS Real Time Gage** (gage / other)

Description: **Level controlled by Kaloko Ditch diversion stoplogs**

Typical Operation ☐ Spillway always flowing ☑ Kept within normal range ☐ Kept Empty ☐ Drained Daily ☐ Only filled by Storms ☐ Other: _____

Sinkhole in Res.: ☐ # Observed: _____ Size: _____ by _____ in. Deep ☐ Not Visible ☑ None Observed
Description: _____

Staff Gage: Description: **USGS Real time gage and staff gage near outlet intake (numbers are not corresponding)**

Findings:

☐ a. The reservoir was not inspected.
☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
☑ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
☐ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
☐ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
☐ f. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

☑ g. The staff gage needs maintenance and/or repair. Description: **Provide reference and/or make numbers consistent between 2 measuring systems (confirm if "0" on staff gage = 20 on USGS gage**
☐ h. A staff gage was not observed at the reservoir. Provide some method of quantifying the water level.
☐ i. A sinkhole was observed in the upstream reservoir. Conduct additional investigations and monitoring to identify the cause, risk and appropriate action.

4. Inflow Works Description:

☑ Number of Inflows **Three (1 - Inflow from Kaloko Ditch, 2 - Drainage area estimated to be 76 acres, 3 - Inflow from Moloaa Ditch via 8" PVC pipe [reported to be closed](photo 220))**

☐ Inflow Culvert / Pipe
Size: _____ in. ☐ DIP ☐ Corrugated Metal ☐ PVC ☐ HDPE ☐ Concrete ☐ Other _____
Control: ☐ Gate ☐ Valve ☐ Flow can either be Shut off or Bypassed
From: ☐ Stream Diversion ☐ Pump ☐ Reservoir ☐ Other _____

☑ Inflow Ditch / Flume **Throwaway control – ¼ mile upstream on ditch**
Dimension: **~ 6-ft Wide and 8-ft Deep** (Size x Depth) Shape **Rectangular at Control**
Surface: ☑ Dirt ☐ Wood ☐ Concrete ☐ Lined w/_____
Control: ☑ Gate ☐ Valve ☑ Flow can either be Shut off or Bypassed
From: ☑ Stream Diversion ☐ Pump ☐ Reservoir ☐ Other **Kaloko Ditch**

Findings:

☐ a. The inflow works were not inspected.
☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
☑ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
☐ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
☐ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
☐ f. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

☑ g. The inflow works needs maintenance and/or repair. Description: **Maintain suitable access to throw away control structure**
☐ h. _____

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5. Upstream Slope: **(Typical Slope ± 2 H : 1 V)**

Slope Protection: ☑ None ☐ Dumped Rock ☐ Fitted Rip Rap ☐ Grouted Rip Rap ☐ Liner _____ ☐ Other: _____

☐ Defect in Protection: Description: _____

Erosion: ☐ Loose soil w/ little vegetation ☐ Rut (<6") ☐ Gully (>6" deep) ☐ Not Visible ☑ None Observed

Description: _____

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☑ Not Visible ☑ None Observed

Description: **Vegetation limited observations**

Sinkholes: ☐ # Observed: _____ Size: _____ and _____ Depth ☐ Not Visible ☑ None Observed

Description: _____

Vegetation: ☐ None ☐ Low Ground Cover ☑ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"

Description: **Thick grasses**

Findings:

☐ a. The upstream slope was not inspected.
☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
☐ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
☐ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
☑ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
☐ f. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

☑ g. Slope protection needs maintenance or repair. Description: **Establish and maintain erosion control ground cover**
☐ h. Rut and/or Gully erosion was observed on the slope, which requires maintenance and/or repair. Description: _____
☐ i. A crack was observed on the slope, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
☐ j. A sinkhole was observed on the slope, which requires further investigation to determine the underlining cause. Repair and monitor the area.
☑ k. The upstream slope was not visible due to ~~high~~ grass ~~and bush~~ vegetation. Clear ~~high~~ vegetation and maintain low to enable easy visual inspection.
☐ l. Tree(s) were observed on the dam embankment. Trees have been identified as the probable cause of piping failures, and can possibly cause severe damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. All repair work shall be accomplished as per the requirements of licensed geotechnical or civil engineer. Routinely monitor the damaged area for signs of settlement and seepage.
☐ m. _____

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6. Crest: Approximate Crest Width: **12 to 15-ft (varies in breach section)**

Access: ☐ None ☐ Walking Path ☑ Roadway, Surface / Width / Usage: **10-ft / Grassed / Vehicle Access**

Erosion: ☐ Loose soil w/ little vegetation ☐ Rut (<6") ☑ Gully (>6" deep) ☐ Not Visible ☐ None Observed

Description: **Breach in embankment-about 161-ft wide at base and 228-ft wide at crest (photos 204, 205)**

Cracks: ☑ Parallel with crest ☑ Perpendicular to crest ☐ Slide visible ☐ Not Visible ☐ None Observed

Description: **Cracks at the end of downstream embankment remnants – unstable slopes**

Sinkholes: ☐ _____ in. Wide x _____ in. Long x _____ in. Deep ☐ Not Visible ☑ None Observed

Description: _____

Vegetation: ☐ None ☑ Low Ground Cover ☐ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"

Description: _____

Findings:

- ☐ a. The crest was not inspected.
- ☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
- ☐ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
- ☐ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
- ☑ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
- ☐ f. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

- ☐ g. Access along the crest was satisfactory.
- ☑ h. Access along the crest was not possible. Description: **Entire crest at breach section not accessible**
- ☐ i. Rut and/or Gully erosion was observed on the crest, which requires maintenance and/or repair. Description: _____
- ☐ j. A crack was observed on the crest, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
- ☐ k. A sinkhole was observed on the crest, which requires further investigation to determine the underlining cause. Repair and monitor the area.
- ☑ l. Portions of the crest were not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
- ☐ m. Tree(s) were observed on the dam embankment. Trees have been identified as the probable cause of piping failures, and can possibly cause severe damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. All repair work shall be accomplished as per the requirements of licensed geotechnical or civil engineer. Routinely monitor the damaged area for signs of settlement and seepage.
- ☑ n. **Embankment remnants (downstream) have very steep end slopes and have been determined to be unstable (AECOM April 2011)**

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7. Downstream Slope: **(Typical Slope ± 2 H : 1 V)**

Access: ☐ lower roadway along toe ☐ roadway to outlet works ☐ walkway to outlet works ☑ None Observed

Slope Protection: ☑ None ☐ Dumped Rock ☐ Rip Rap ☐ Grouted Rip Rap ☐ Concrete

Erosion: ☐ Loose soil w/ little vegetation ☐ Rut (<6") ☑ Gully (>6" deep) ☐ Not Visible ☐ None Observed

Description: **Left side of embankment has been noted to have a large erosion hole (AECOM April 2011)**

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☑ Not Visible ☑ None Observed

Description: **Excessive vegetation limited observations and access**

Sinkholes: ☐ _____ in. Wide x _____ in. Long x _____ in. Deep ☑ Not Visible ☑ None Observed

Description: **Excessive vegetation limited observations and access**

Vegetation: ☐ None ☐ Low Ground Cover ☑ Bushes or Tall Grass ☑ Trees # **100+** ☑ <6" ☑ >6" & <20" ☑ >20"

Description: **Excessive vegetation on left, breach section and right downstream slope (photos 206, 207, 208)**

Seepage: Seep Spot Number 1

☐ Green Vegetation ☐ Wet or Muddy Ground ☑ Ponding Water ☐ Not Visible ☐ None Observed

☐ Flowing, Description: **Excessive vegetation limited access**

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: **Ponded water on second (lower) bench, 4/16/14 and 4/12/16 (photos 206, 207)**

Findings:

☐ a. The downstream slope was not inspected.
☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
☐ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
☐ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
☑ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
☐ f. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

☑ g. Slope protection needs maintenance or repair. Description: **Establish and maintain erosion control ground cover**
☑ h. Rut and/or Gully erosion was observed on the slope, which requires maintenance and/or repair. Description: **Remediate large erosion hole on the left remnant with suitable material**
☐ i. A crack was observed on the slope, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
☐ j. A sinkhole was observed on the slope, which requires further investigation to determine the underlining cause. Repair and monitor the area.
☑ k. The down stream slope was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
☑ l. Tree(s) were observed on the dam embankment. Trees have been identified as the probable cause of piping failures, and can possibly cause severe damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. All repair work shall be accomplished as per the requirements of licensed geotechnical or civil engineer. Routinely monitor the damaged area for signs of settlement and seepage.
☑ m. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.
☐ n. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.
☑ o. The slope was very steep, around a 1 to 1 slope, further study is required to verify slope stability.
☑ p. **Reestablish access to the downstream slope and toe**
☑ q. **Embankment has been breached – breach needs to be stabilized**

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8. Abutments:

Erosion: ☐ Loose soil w/ little vegetation ☐ Rut (<6") ☐ Gully (>6" deep) ☐ Not Visible ☑ None Observed

Description: _____

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☐ Not Visible ☑ None Observed

Description: _____

Vegetation: ☑ None ☐ Low Ground Cover ☐ Bushes or Tall Grass ☑ Trees # **~20** ☐ <6" ☑ >6" & <20" ☐ >20"

Description: **About 20 large trees on the Right Downstream Abutment. Unable to determine Left Abutment as downstream slope is too overgrown to inspect (photos 203, 204, 205)**

Seepage:

Seep Spot Number 1

☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☑ Not Visible ☑ None Observed

☐ Flowing, Description: _____

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Seep Spot Number 2

☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☑ Not Visible ☑ None Observed

☐ Flowing, Description: _____

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Findings:

- ☐ a. The abutments were not inspected.
- ☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
- ☐ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
- ☑ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
- ☐ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
- ☐ f. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

- ☑ g. Slope protection needs maintenance or repair. Description: **Establish and maintain erosion control ground cover**
- ☐ h. Rut and/or Gully erosion was observed, which requires maintenance and/or repair. Description: _____
- ☐ i. A crack was observed along the abutments, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
- ☐ j. The abutment area was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
- ☑ k. Tree(s) were observed on the dam embankment. Trees have been identified as the probable cause of piping failures, and can possibly cause severe damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. All repair work shall be accomplished as per the requirements of licensed geotechnical or civil engineer. Routinely monitor the damaged area for signs of settlement and seepage.
- ☐ l. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.
- ☐ m. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.
- ☑ n. **Reestablish access to abutments**

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9. Toe:

Erosion: ☐ Loose soil w/ little vegetation ☐ Rut (<6") ☐ Gully (>6" deep) ☑ Not Visible ☑ None Observed

Description: **Excessive vegetation prohibited safe access**

Cracks: ☐ Parallel with crest ☐ Perpendicular to crest ☐ Slide visible ☑ Not Visible ☑ None Observed

Description: **Excessive vegetation prohibited safe access**

Vegetation: ☐ None ☐ Low Ground Cover ☑ Bushes or Tall Grass ☑ Trees # **50 +** ☑ <6" ☑ >6" & <20" ☑ >20"

Description: **Excessive vegetation – high vegetation and trees (photos 206, 207, 208)**

Seepage: Seep Spot Number 1

☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☑ Not Visible ☑ None Observed

☐ Flowing, Description: **Excessive vegetation prohibited safe access**

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Seep Spot Number 2

☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☑ Not Visible ☑ None Observed

☐ Flowing, Description: **Excessive vegetation prohibited safe access**

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Findings:

☑ a. The toe was not inspected.
☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
☐ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
☐ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
☐ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
☑ f. Unknown – Not visible, **not accessible, not inspected**, or unable to determine based on the observation taken.

Corrective Actions:

☑ g. Slope protection needs maintenance or repair. Description: **Establish and maintain erosion control ground cover**
☐ h. Rut and/or Gully erosion was observed, which requires maintenance and/or repair. Description: _____
☐ i. A crack was observed along the near the toe, which requires further investigation to determine the underlining cause. Monitor the area and/or repair as required.
☑ j. The toe area was not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.
☑ k. Tree(s) were observed on the dam embankment. Trees have been identified as the probable cause of piping failures, and can possibly cause severe damage to the embankment if they are uprooted during a high winds. Corrective action is required to remove the tree hazards from the dam. All repair work shall be accomplished as per the requirements of licensed geotechnical or civil engineer. Routinely monitor the damaged area for signs of settlement and seepage.
☐ l. Seepage/Ponding water was observed. Monitor and conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.
☐ m. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil from the embankment. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area.
☑ n. **Reestablish access to the downstream slope and toe**

10. Outlet Works:

Culvert / Pipe

Type / Size: **Three 24-in PVC Puka Pipe Risers to a manifold near the Right Abutment – unknown grouting and tunnel entrance. The pipe daylights in a 5-ft x 5-ft tunnel beyond the Right Abutment. The PVC pipe at this point is 18-in and runs in the old ditch. The 18-in pipe has an 18-in butterfly valve and then continues to a thrust block. At the thrust block an 18-in PVC pipe tees off to the left (KICO) with an 18-in butterfly valve. Another 18-in line continues straight (Lucas) with an 18-in butterfly valve. And there is also an 8-in PVC pipe that branches off the thrust block and controlled by an 8-in butterfly valve (reported to be a drain line at the filter station) (photos 210, 211, 215, 216)**

Culvert: ☐ Concrete ☐ Masonry ☐ unlined earth ☐ Other _____

Pipe: ☐ DIP ☐ Corrugated Metal ☑ PVC ☐ HDPE ☐ Concrete ☐ Other _____

Control Type: ☐ Gate ☑ Valve ☐ Other **18-in butterfly valves / 8-in butterfly drain valve**

Location: ☐ Control on Upstream side ☑ Control on Downstream side

Seepage: ☐ Green Vegetation ☐ Wet or Muddy Ground ☐ Ponding Water ☐ Not Visible ☑ None Observed

☐ Flowing, Description: _____

Water Clarity: ☐ Clear ☐ Some particles ☐ Muddy ☐ Other: _____

Description: _____

Findings:

☑ a. The outlet works were not tested

. ☐ b. The outlet works were not inspected

☐ c. Satisfactory – Expected to fulfill intended function – no corrective action required.

☑ d. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.

☐ e. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.

☐ f. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.

☐ g. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

☐ h. Seepage/Ponding water was observed. Conduct further investigation to locate the source of water and extent of any possible hazardous or developing condition.

☐ i. Seepage was observed flowing and particles were observed to be removed by the flow. Take immediate action to stop the loss of soil. Conduct further investigation to determine the underlining cause and take corrective action. Monitor the area. Failures caused by seepage/piping along the outlet conduit are very common and are considered to be a dangerous situation.

☐ j. Were not visible due to high grass and bush vegetation. Clear high vegetation and maintain low to enable easy visual inspection.

☑ k. **Consider upstream control**

☑ l. **Verify operational condition of all valves. Confirm that the drain valve is functional.**

☑ m. **Investigate and document condition of tunnel entrance from puka pipes. Vault reported to have been grouted – unknown valve condition/status and needs to be evaluated**

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11. Spillway: **NO SPILLWAY**

Type: ☑ None ☐ Culvert/Pipe ☐ Channel

Description: _____

Dimension: _____ ft. Invert elevation: _____ ft. per staff gage

Slope Protection: ☐ None ☐ Grass ☐ Dumped Rock ☐ Fitted Rip Rap ☐ Grouted Rip Rap ☐ Concrete

☐ Defect in Protection: Description: _____

Approach: ☐ Clear ☐ High Veg. ☐ Trees ☐ Other: _____

Erosion: ☐ Scour ☐ Gully ☐ Headcut ☐ Not Observed ☐ Other: _____

Description: _____

Vegetation: ☐ None ☐ Low Ground Cover ☐ Bushes or Tall Grass ☐ Trees #_____ ☐ <6" ☐ >6" & <20" ☐ >20"

Description: _____

Findings:

☐ a. The spillway was not inspected.
☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
☐ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
☐ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
☑ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
☐ f. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

☐ g. Slope protection needs maintenance or repair. Description: _____
☐ h. The spillway approach was blocked. Clear approach.
☐ i. Severe scour erosion was observed which requires maintenance and/or repair.
Description: _____
☐ j. A headcut was observed downstream of the spillway. Corrective / mitigative action is required to prevent this problem from moving upstream.
☐ k. Trees are unacceptable in the spillway channel and approach. Take corrective action to address the woody vegetation problem and repair the damaged area.
☐ l. Unclear if spillway is adequately sized. Spillway should pass the probable maximum flood. Verify spillway capacity and take corrective action as required.
☑ m. **Design and construct a spillway to safely pass the Inflow Design Flood**

12. Downstream Channel:

Name: **Breach section overflows to Wailapa Stream towards former Morita Reservoir**

Downstream: ☐ Sump ☐ Open Area ☐ Un-Defined Drainage-way ☑ Defined Drainage-way ☐ Other _____

Items along Stream Bank: ☐ None ☑ Road ☑ Houses ☐ Town ☑ Not Inspected

Description: **Morita Reservoir has been removed**

Findings:

☑ a. The downstream channel was not inspected.
☐ b. Satisfactory – Expected to fulfill intended function – no corrective action required.
☐ c. Fair - Expected to fulfill intended function, but maintenance or other actions are recommended.
☐ d. Poor – May not fulfill intended function; maintenance, repairs, or other actions are necessary.
☐ e. Unsatisfactory – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.
☑ f. Unknown – Not visible, not accessible, not inspected, or unable to determine based on the observation taken.

Corrective Actions:

☐ g. _____

Additional Comments:

Access to the Kaloko Ditch throwaways needs to be continually maintained so that operations can reach them to control flows during inclement weather conditions.

The Crest, Upstream and Downstream Embankment remnants have been determined to be unstable (AECOM April 2011).

A Spillway needs to be designed and constructed to appropriately pass the Inflow Design Flood.

Ka Loko Reservoir and Kaloko Reservoir are names which have been used in various reports. Kaloko Reservoir was used in this report.

The Upstream Slope/crest may have been regraded since the AECOM April 2011 site visit and survey. An updated survey should be completed for future design purposes.

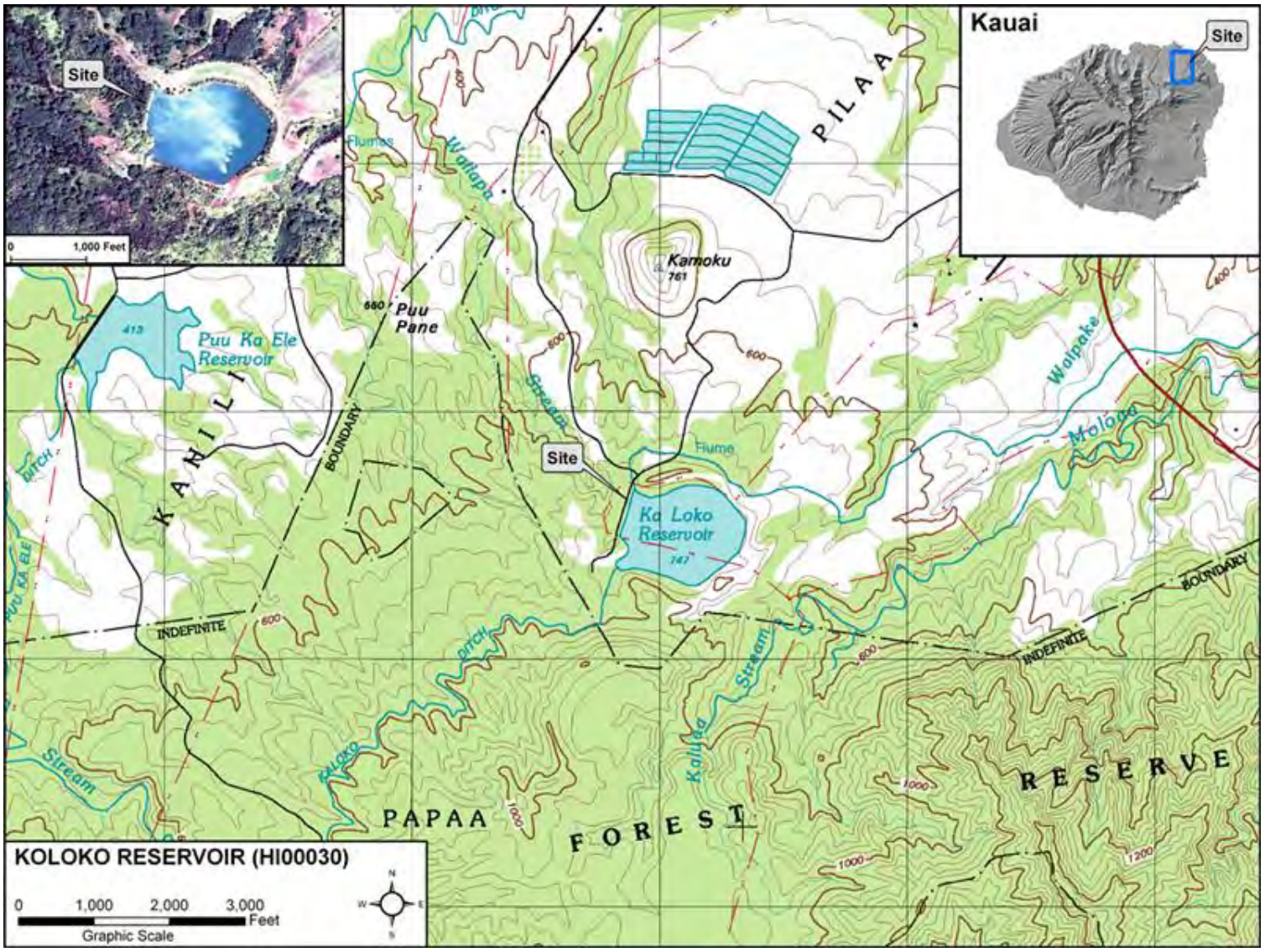
No substantial remediation has been done since the 2006 breach of this dam and reservoir. Remediation and stabilization are needed.

Limitations and Intent of this Dam Safety Inspection:

This Dam Safety Inspection was conducted to assess the general overall condition of the reservoir/dam, identify visible deficiencies, and recommend areas of for monitoring, additional investigative studies and corrective actions. The inspection is based only on visible features/areas of the dam at the time of inspection. No assurance can be made regarding the dam's condition after this date. Subsequent adverse weather and other factors may affect the dam's condition. This inspection is not a formal phase I or phase II dam safety inspection and may not include a review or evaluation from each specialist of an inspection team, such as a geologists, civil, geotechnical, structural, or hydraulics engineer. The owner should verify the findings of this report and take corrective actions. The owner may submit to the State alternative corrective actions that are certified by a licensed professional engineer in the State of Hawaii experienced in the design and construction of dams. This inspection does not relieve the owner/operator from their responsibility to conduct routine inspections, maintenance, repairs, modifications, monitoring, documentation, and/or investigative studies. The inspection was conducted under the authority of the Hawaii Revised Statures Chapter 179D, and Hawaii Administrative Rules, Title 13, Chapter 190, titled "Dams and Reservoirs". Questions regarding this inspection should be forwarded to the Hawaii State Dam Safety Program; DLNR Engineering Division; PO Box 373; Honolulu, Hawaii 96809; Ph. (808) 587-0236.

Revised: October 28, 2006 : August 3, 2009

KALOKO RESERVOIR | KA-0030 | Kauai



1. General Information

a. **State Dam ID**	KA-0030
b. **National ID**	HI00030
c. **Dam Name**	KALOKO RESERVOIR
d. **Other Name(s)**	
e. **Longitude / Latitude**	-159.3798 / 22.1781
f. **County / Island**	Kauai / Kauai
g. **Type of Dam**	Earthen
h. **Purpose**	Irrigation
i. **Completed / Last Modified**	1890 / -
j. **Nearest City / Town**	Kilauea (2.6 miles)
k. **Water Body Type**	State Regulated Dam
l. **Dam Height**	27 ft
m. **Dam Length**	915 ft
n. **Drainage Area**	0.12 sq. miles / 77 acres
o. **Size Classification**	Intermediate

2. Owner Information

a. **Name of Owner**	Mary N. Lucas Trust (Cassiday); Mary N. Lucas Trust (Taylor); Pflueger Properties
b. **TMK(s):**	(4) 5-1-002:001, (4) 5-1-002:005

3. Hazard Potential Classification

a. **Hazard Classification**	High
b. **Emergency Action Plan**	Yes

KALOKO RESERVOIR | KA-0030 | Kauai

Aerial Photo (07/12/2007)

4. Reservoir

a. **Normal Storage**	1,255 ac-ft / 409 MG
b. **Maximum Storage**	1,400 ac-ft / 456 MG
c. **Surface Area**	38.0 acres

5. Primary Spillway

a. **Minimum Spillway Width**	
b. **Spillway Length**	
c. **Spillway Type**	None Found
d. **Protection**	
e. **Maximum Discharge**	

6. Primary Outlet Works

a. **Works Type**	Downstream Control
b. **Maximum Discharge**	
c. **Size**	18 Inch
d. **Control Description**	18 Inch PVC Pipe in Tunnel at Left Abutment

7. Embankment

a. **Type of Dam**	Earthen
b. **Minimum Crest Width**	
c. **Upstream Slope Grade**	
d. **Upstream Slope Protection**	Vegetation
e. **Downstream Slope Grade**	
f. **Downstream Slope Protection**	Vegetation
g. **Dam Height**	27 ft
h. **Dam Length**	915 ft

8. Inflow Works

Type	Name	Controlled	Size
Ditch	Kaloko Ditch	Yes	~ 6 Ft Wide by 8 Ft Deep at Gate
Ditch	Moloaa Ditch	No	8 Inch PVC

Kalako Reservoir (KA-0030)
dam from afar

Kaloko (201).JPG

Kalako Reservoir (KA-0030)
view from right abutment

W 159.37977° Kaloko (203).JPG 12/Apr/16 9:23:48 AM
N 22.17713°

Kalako Reservoir (KA-0030)
view of left abutment

W 159.37932° Kaloko (204).JPG 12/Apr/16 9:35:48 AM
N 22.17789°

Kalako Reservoir (KA-0030)
view of breach from reservoir

W 159.37942° Kaloko (205).JPG 12/Apr/16 9:36:25 AM
N 22.17819°

Kalako Reservoir (KA-0030)
ponding water in breach

W 159.37962° Kaloko (206).JPG 12/Apr/16 9:38:25 AM
N 22.17812°

Kalako Reservoir (KA-0030)
ponding water in breach

W 159.37965° Kaloko (207).JPG 12/Apr/16 9:38:29 AM
N 22.17815°

Kalako Reservoir (KA-0030)
trees in breach

W 159.37965° Kaloko (208).JPG 12/Apr/16 9:38:35 AM
N 22.17815°

Kalako Reservoir (KA-0030)
intake to outlet works

W 159.37874° Kaloko (210).JPG 12/Apr/16 9:47:54 AM
N 22.17845°

Kalako Reservoir (KA-0030)
intake to outlet works

W 159.37894° Kaloko (211).JPG 12/Apr/16 9:48:11 AM
N 22.17849°

Kalako Reservoir (KA-0030)
downstream slope to outlet works

W 159.37958° Kaloko (212).JPG 12/Apr/16 9:58:08 AM
N 22.17892°

Kalako Reservoir (KA-0030)
downstream slope to outlet works

W 159.37923° Kaloko (213).JPG 12/Apr/16 10:04:57 AM
N 22.17977°

Kalako Reservoir (KA-0030)
outlet tunnel

W 159.37927° Kaloko (214).JPG 12/Apr/16 10:05:28 AM
N 22.17997°

Kalako Reservoir (KA-0030)
downstream outlet valves

W 159.37889° Kaloko (215).JPG 12/Apr/16 10:08:19 AM
N 22.18006°

Kalako Reservoir (KA-0030)
downstream outlet valves

W 159.37933° Kaloko (216).JPG 12/Apr/16 10:08:28 AM
N 22.17997°

Kalako Reservoir (KA-0030)
downstream access road to outlet

W 159.37974° Kaloko (217).JPG 12/Apr/16 10:09:39 AM
N 22.18020°

Kalako Reservoir (KA-0030)
view from embankment

W 159.38058°
N 22.18068°
Kaloko (218).JPG
12/Apr/16 10:12:36 AM

Kalako Reservoir (KA-0030)
access road to Moloaa diversion

W 159.37671°
N 22.17496°
Kaloko (219).JPG
12/Apr/16 10:28:40 AM

Kalako Reservoir (KA-0030)
Moloaa diversion ditch

W 159.37694°
N 22.17477°
Kaloko (220).JPG
12/Apr/16 10:32:35 AM

Kalako Reservoir (KA-0030)
access road to Moloaa diversion

W 159.37715°
N 22.17472°
Kaloko (221).JPG
12/Apr/16 10:35:51 AM

Kalako Reservoir (KA-0030)
dosnstream view from crest - small reservoir on left side

W 159.37711° Kaloko (223).JPG 12/Apr/16 10:44:05 AM
N 22.17982°

Kalako Reservoir (KA-0030)
downstream slope

W 159.37849° Kaloko (224).JPG 12/Apr/16 10:48:19 AM
N 22.17989°

Kalako Reservoir (KA-0030)
tree on downstream slope

W 159.37849° Kaloko (225).JPG 12/Apr/16 10:48:22 AM
N 22.17989°

Kalako Reservoir (KA-0030)
downstream toe - debris removed from dam

W 159.37758° Kaloko (226).JPG 12/Apr/16 10:48:51 AM
N 22.18039°

Kalako Reservoir (KA-0030)
downstream toe - debris removed from dam

W 159.37758° Kaloko (227).JPG 12/Apr/16 10:48:54 AM
N 22.18039°

Kalako Reservoir (KA-0030)
piping on downstream slope

W 159.37752° Kaloko (228).JPG 12/Apr/16 10:49:15 AM
N 22.18053°